to include the extension underlying the back half of coil **102**. Or, P_3 **(106)** may also be chosen to include that portion of a pole piece which underlies the back half of coil **102**. Similarly, other configurations may be utilized to satisfy the coil requirements for the head of the present invention. For example, a separate or additional coil may be utilized which might, for example, surround pole piece P_3 to provide a different preconditioning signal than the write signal.

As shown in FIG. **4**, the construction of a prior art ring head coil **140** may include a pair of C-shaped pole pieces **142, 144** joined by suitable means as known in the art at one end thereof, as shown at **146**. One or more coils **148, 150** may be wrapped around the C-shaped pole pieces **142, 144** in order to energize a write or read gap **152** between the opposite ends **154, 156** of C-shaped pole pieces **142, 144**. An alternative construction for a ring head coil **158** includes a C-shaped pole piece **160** and an I-shaped pole piece **162** joined at an end thereof as at **164** with a coil **166** wrapped around the I-shaped pole piece **162**. In this construction, a read or write gap **168** is formed between the opposite ends **170, 172** of the two pole pieces **160, 162**. This construction might be in some circumstances easier to manufacture as the coil **166** may be readily wrapped around the I-shaped pole piece **162** prior to its being joined as at joint **164** using convenient manufacturing methods, as known in the art.

The present invention may be implemented in the ring head coil **174** in a construction as depicted in FIG. **6**. In that construction, a center I-shaped pole piece **176** having a coil **178** wrapped therearound is surrounded on either side by a C-shaped pole piece **180**, and a C-shaped pole piece **182**, both of which are joined at an end to the I-shaped pole piece **166** at joints **184, 186**. A write gap g_1 is formed between the ends **188** of C-shaped pole piece **180** and end **190** of I-shaped pole piece **176**. A preconditioning gap g_2 is formed between the end **192** of C-shaped pole piece **182** and end **190** of I-shaped pole piece **176**. In ring coils, write gaps may be somewhat larger than those in presently manufactured thin film heads. For example, write head gap g_1 may be of a size of approximately 0.2 microns up to 0.5 microns, and even larger depending upon the particular application such as for video tape, etc. For purposes of the present invention, it is only important that the width of preconditioning gap g_2 be chosen as is sufficient to precondition the magnetic medium prior to its being written on with write gap g_1. In the preferred embodiment, the inventor contemplates that the preconditioning gap g_2 is larger than the write gap g_1.

Still another aspect of the present invention is the improvement in the head field gradient, and the ability of the manufacturer to alter and adjust the head field gradient by adjusting the gap widths. As shown by the inventors' prior work, the head field gradient may be sharpened to facilitate the writing of sharp transitions on a magnetic medium by locating a shim in an existing write gap. However, until the present invention, a physical embodiment or construction to implement a shim placement has not been known. With the present invention, an integral construction is provided which lends itself readily to location of the center pole piece and its use as part of both the write gap and preconditioning gap for achieving an improved or sharpened head field gradient. This sharpened head field gradient also renders the head more suitable for perpendicular recording for which sharp transitions are especially important.

Still other variations in construction may be considered and implemented by those skilled in the art in order to facilitate manufacture, or for other reasons, and yet not depart from the spirit and scope of the invention. The present invention shall not be considered to be limited to the construction of the preferred embodiment as has been previously described and instead should be limited only by the scope of the claims appended hereto, and their equivalents.

What is claimed is:

1. A thin film magnetic recording head having a pair of gaps formed between three pole pieces, said gaps being substantially aligned to successively traverse the same portion of a recording medium as the head is moved thereacross, the center pole piece having a planar thin film coil wrapped therearound for magnetically energizing each of said gaps simultaneously, said planar thin film coil being disposed in a substantially singular plane, said plane being substantially perpendicular to a head surface that faces said recording medium during recording, whereby said portion of the recording medium can be preconditioned by one of said gaps before the other of said gaps is moved across said preconditioned portion.

2. The thin film magnetic recording head of claim **1** wherein said pair of gaps comprises a write gap and a preconditioning gap, said preconditioning gap being wider than said write gap.

3. The thin film magnetic recording head of claim **2** wherein said gaps are formed between a pole tip of each of said pole pieces, said pole tips having a preselected width, as desired.

4. The thin film magnetic recording head of claim **2** wherein said pole pieces overlie each other and the coil in an integrated thin film structure.

5. The thin film magnetic recording head of claim **4** wherein said structure includes a first pole piece P_1, a substantially helically wound pancake coil overlying P_1, a second pole piece P_2 overlying a portion of said coil and magnetically coupled to P_1 at a medial position thereof through a center of said coil, and a third pole piece P_3 overlying P_2 and magnetically coupled to an end thereof.

6. The thin film magnetic recording head of claim **5** wherein P_3 is magnetically coupled to P_2 through a portion of P_1.

7. The thin film magnetic recording head of claim **5** wherein P_3 is magnetically coupled to P_1 at an end thereof to substantially surround P_2 and the coil between them.

8. In a thin film magnetic recording head having a planar thin film magnetic coil, a first pole piece P_1 substantially underlying a first half of said magnetic coil, and a second pole piece P_2 substantially overlying the first half of said magnetic coil, the pole pieces P_1 and P_2 together defining a write gap, the improvement comprising an extension of the pole piece P_1 which substantially underlies a second half of the magnetic coil, and a third pole piece P_3 that substantially overlies the second half of the magnetic coil and the pole piece P_2, the pole pieces P_2 and P_3 together defining a preconditioning gap, said preconditioning gap being substantially aligned with said write gap for traversing and preconditioning a portion of a recording medium before said write gap is moved across said preconditioned portion, said magnetic coil being capable of energizing both of said gaps simultaneously.

9. The improved thin film magnetic recording head of claim **8** wherein said coil is a substantially helically wound pancake magnetic coil.

10. The improved thin film magnetic recording head of claim **8** wherein the pole piece P_3 is magnetically coupled to the pole piece P_2 through a portion of the pole piece P_1.

11. A thin film magnetic recording head comprising first, second and third pole pieces having at least distal ends, said pole pieces substantially lying in first, second and third planes, respectively, the distal ends of said pole pieces

together defining a pair of gaps, said gaps being aligned to successively traverse the same portion of a recording medium as the head is moved thereacross, and a magnetic coil simultaneously for energizing both of said gaps, said magnetic coil being comprised of a plurality of windings, said windings being substantially aligned to be successively adjacent one another so that substantially all of said windings lie in a single plane and extend around a portion of one of said pole pieces, whereby said portion of the recording medium can be preconditioned by one of said gaps before the other of said gaps is moved across said preconditioned portion.

12. The thin film magnetic recording head of claim **11** wherein the second pole piece is positioned between the first and third pole pieces.

13. The thin film magnetic recording head of claim **12** wherein the magnetic coil extends around a portion of the second pole piece.

14. The thin film magnetic recording head of claim **13** wherein the pair of gaps comprise a write gap and a preconditioning gap.

15. The thin film magnetic recording head of claim **14** wherein the second pole piece has an end thereof magnetically coupled to the first pole piece, and the third pole piece has an end thereof magnetically coupled to the second pole piece.

16. The thin film magnetic recording head of claim **15** wherein the third pole piece is magnetically coupled to the second pole piece through a portion of the first pole piece.

17. The thin film magnetic recording head of claim **16** wherein said coil is a thin film pancake coil.

18. The thin film magnetic recording head of claim **14** wherein said preconditioning gap is wider than said write gap.

19. The thin film magnetic recording head of claim **18** wherein the write gap is between about 0.10 microns and about 0.25 microns in width.

20. The thin film magnetic recording head of claim **19** wherein the preconditioning gap is approximately 0.5 micron in width.

21. A thin film magnetic recording head having a pair of gaps formed between three pole pieces, said pair of gaps being aligned with one another to successively traverse the same portion of a recording medium as the head is moved thereacross, said pole pieces including a center pole piece substantially lying in a single plane, said center pole piece having a single thin film coil wrapped around a portion thereof for magnetically energizing both of said gaps simultaneously, said thin film coil substantially lying in a single plane generally parallel to the plane of said center pole piece, whereby said portion of the recording medium can be preconditioned by one of said gaps before the other of said gaps is moved across said preconditioned portion.

22. The recording head of claim **21** wherein said pole pieces further include upper and lower pole pieces.

23. The recording head of claim **22** wherein the center pole piece overlies a portion of said coil and is magnetically coupled to the lower pole piece through a center of said coil.

24. The recording head of claim **23** wherein the upper pole piece is magnetically coupled to the center pole piece through a portion of the lower pole piece.

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25. A thin film magnetic recording head, comprising a magnetic pole structure defining a pair of gaps arranged in succession along a predetermined direction, and a single planar coil capable of simultaneously magnetically energizing said gaps such that a portion of a recording medium moved across said gaps in said predetermined direction is preconditioned by one of said gaps prior to movement across the other of said gaps.

26. A method of producing a thin film magnetic recording head, comprising arranging a magnetic pole structure so as to define a pair of gaps arranged in succession along a predetermined direction, and disposing a single planar coil such that said pair of gaps can be energized simultaneously by said coil, whereby a portion of a recording medium moved across said gaps in said predetermined direction is preconditioned by one of said gaps prior to movement across the other of said gaps.